Full-Cycle Performance-Based Planning and Programming

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June 10, 2020

How do you invest for your future?

1. Need and Purpose

- Need:
  - Establish measures to conform to legislative requirements for performance-based planning and programming (Federal and State)
  - Develop and implement methodologies to support decisions for investing in transportation programs and projects

- Purpose of today's discussion:
  - Identify concepts of performance-based processes and procedures to support decision making throughout program and project development
  - Identify current data and tools used to drive processes and procedures
  - Discuss challenges and development needs

Federal and State Requirements

MAP – 21 (Moving Ahead for Progress in the 21st century)

- Requires states and MPOs to collectively **set performance targets** in TIPs and STIP (passed in 2012)

FAST Act (Fixing America's Surface Transportation Act)

- Continues these federal requirements (passed in 2015)

Texas House Bill 20 (passed in 2015)

- Requires TxDOT and MPOs to develop and implement performance metrics and measures for the Statewide Transportation Improvement Plan (STIP), Rural Transportation Plans (RTP), and the Unified Transportation Program (UTP)

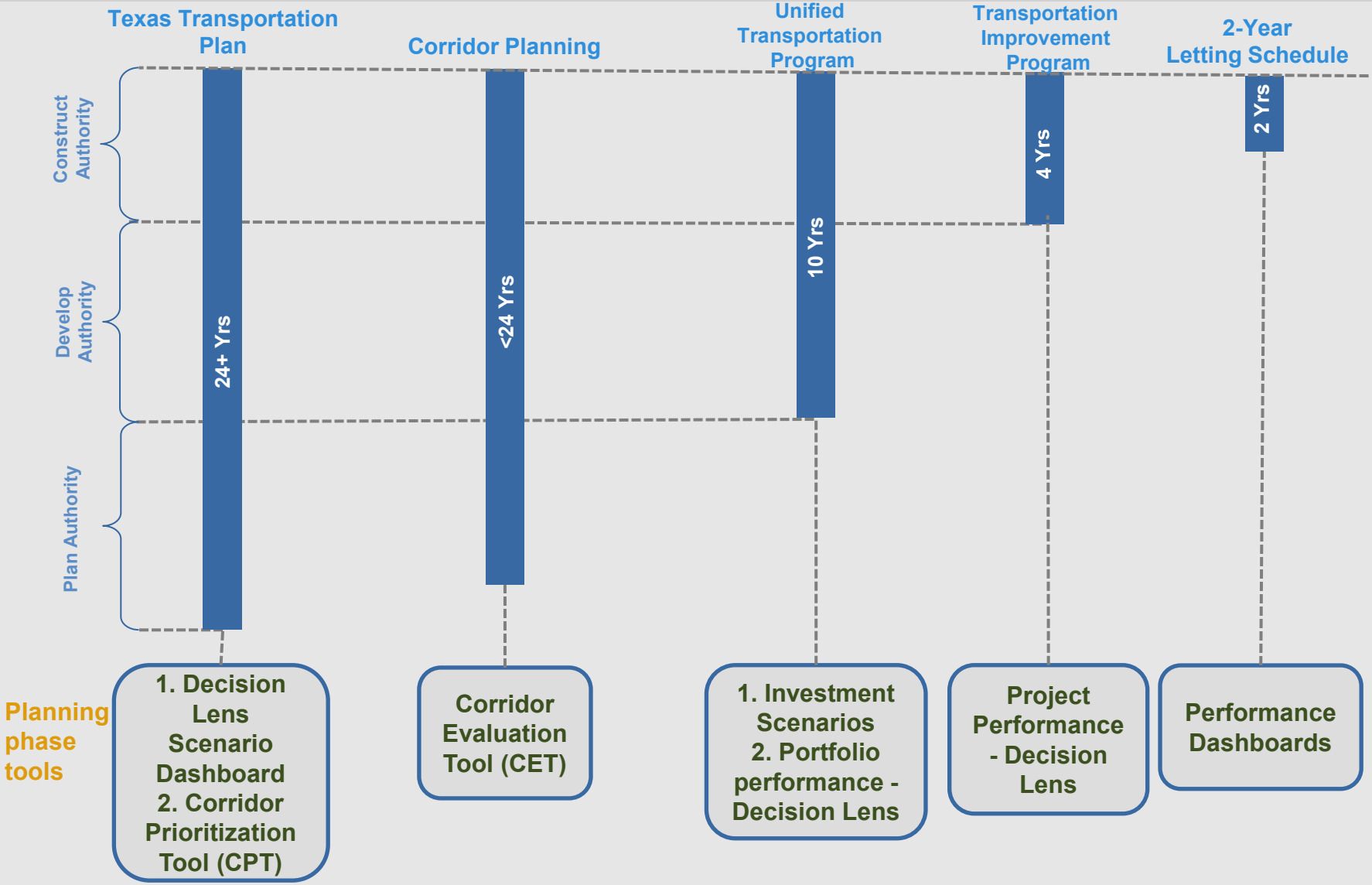
Texas Senate Bill 312 - TxDOT Sunset Bill (passed in 2017)

- Plans and policy efforts are to contain system strategies, goals and measurable targets, and related performance measures
- Analyze the effect of funding allocation and project selection decisions on accomplishing goals in the statewide Long-range Transportation Program (LRTP)
- For projects in the UTP, evaluate projects based on strategic need and potential contribution toward achieving goals prior to considering other criteria such as funding availability and project readiness

2. Vision: Full-Cycle Performance-Based Planning & Programming

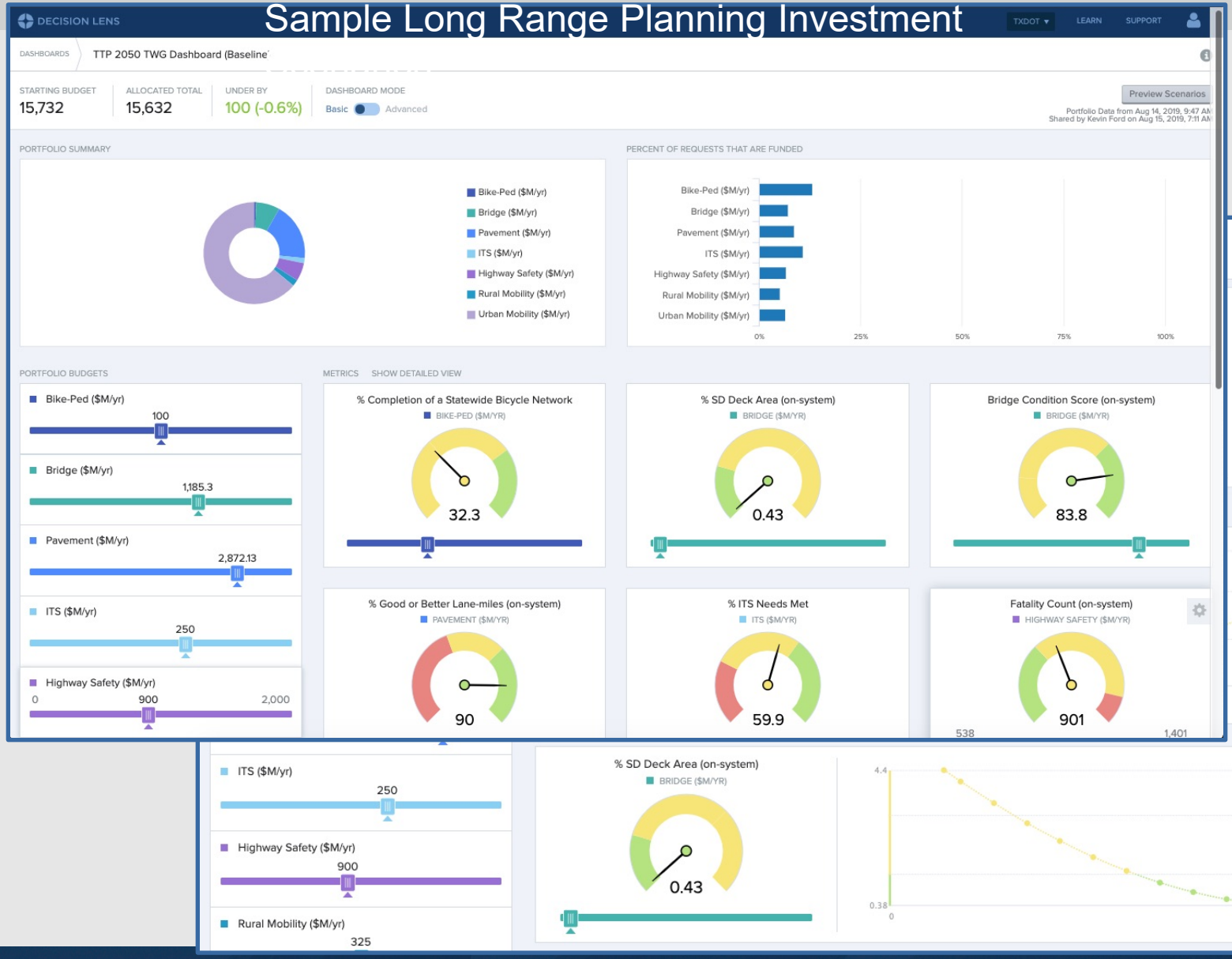
TxDOT will use performance-based planning and programming to help inform decision-making for the life-cycle of programs: statewide funding category investments, system-wide corridor priorities, and project-portfolio priorities.

Transportation Planning: Plans, Programs, & Evaluation Tools



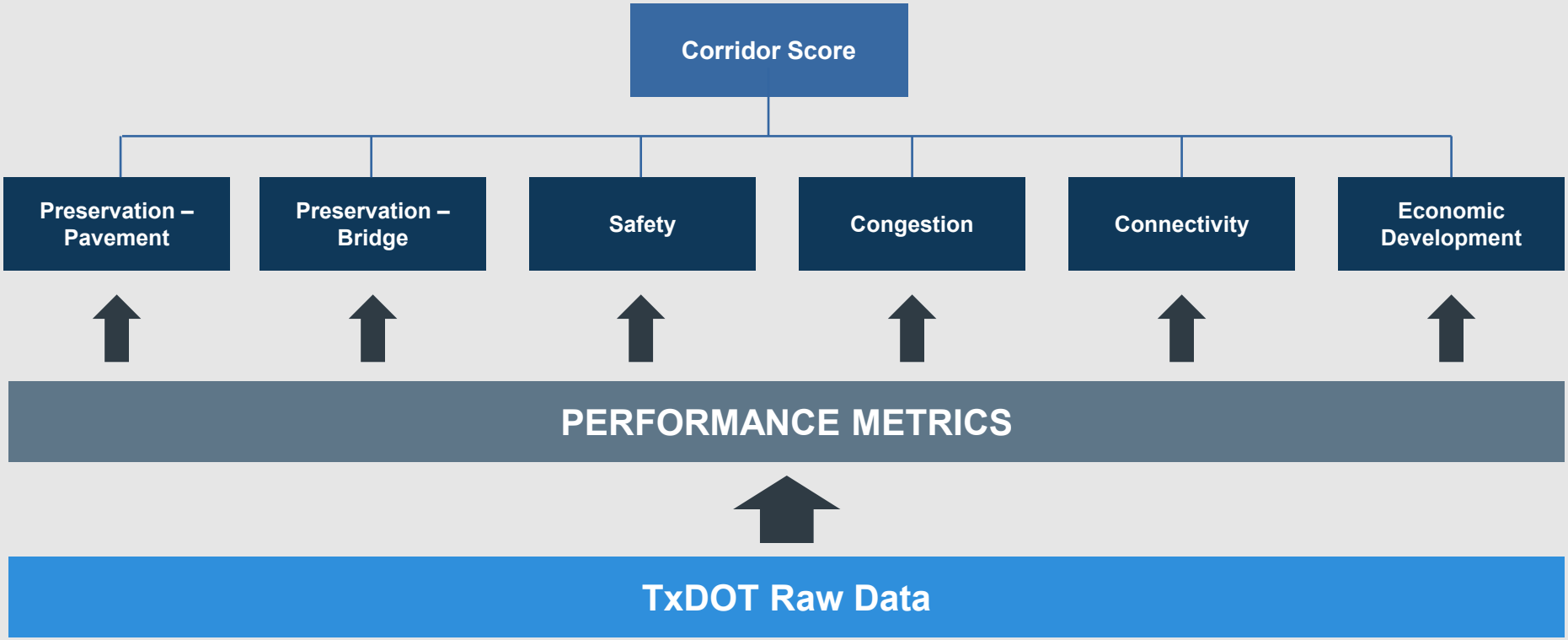
3. Performance-Based Approaches to Support Long Range Planning

Sample Long Range Planning Investment



Prioritization of Corridor Studies by System-wide Need

System-wide Performance Measure Scoring



- Numeric scores allow comparison of multiple corridors
- Weighting factors allow varying focus areas
- Trackable over time as data are updated

Process Automation for Corridor Prioritization

TxDOT Data

Raw Input

Criteria	Performance Measure	Raw Value
	Pavement	
1	Pavement Condition Score	89.8
2	% Pavement with Pavement Condition Score < 60	5.7%
	Bridge	
3	Bridge Sufficiency Score	92.8
4	% Deck Area on Bridges with Suff Rating < 60	0.0%
	Safety	
5	K&A crash rate for entire corridor	3.5
6	Total crash rate for entire corridor	55.3
	Congestion	
7	% Count Stations with Existing V/C > 0.80	0.0%
8	% Count Stations with Future V/C > 0.80	18.5%
9	Texas Transp Institute hot spot list for all	0.0%
10	Texas Transp Institute hot spot list for trucks	0.0%
	Economic Development	
11	Daily Freight Volumes	9,300
12	Commodity Flow	142M
13	Existing employment	157
14	Existing population	349
15	Projected annual traffic growth rate	3.8%
16	% of Privately held land	99.2%
	Connectivity	
17	Provides access to existing multi-modal facilities or major traffic generators	0.44
18	Part of hurricane evacuation route	100%
19	Part of National Freight Network or TxDOT Primary Freight Network	100%

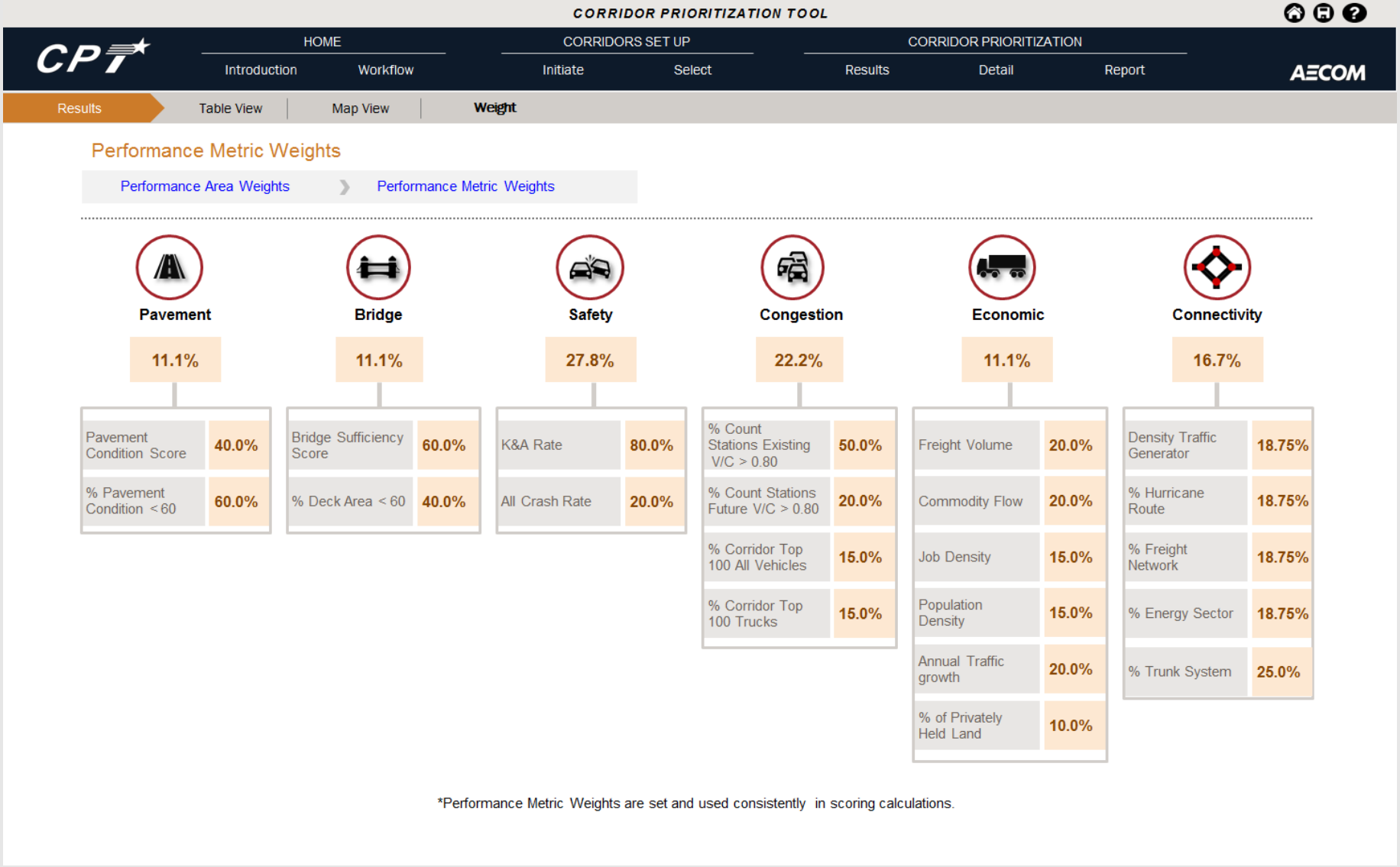
Data Extraction Tool

Score

Criteria	Performance Measure	Score
	Pavement	
1	Pavement Condition Score	5.1
2	% Pavement with Pavement Condition Score < 60	5.7
	Bridge	
3	Bridge Sufficiency Score	1.0
4	% Deck Area on Bridges with Suff Rating < 60	0.0
	Safety	
5	K&A crash rate for entire corridor	3.9
6	Total crash rate for entire corridor	1.3
	Congestion	
7	% Count Stations with Existing V/C > 0.80	0.0
8	% Count Stations with Future V/C > 0.80	2.3
9	Texas Transp Institute hot spot list for all	0.0
10	Texas Transp Institute hot spot list for trucks	0.0
	Economic Development	
11	Daily Freight Volumes	4.8
12	Commodity Flow	4.3
13	Existing employment	5.2
14	Existing population	5.6
15	Projected annual traffic growth rate	6.3
16	% of Privately held land	9.2
	Connectivity	
17	Provides access to existing multi-modal facilities or major traffic generators	2.5
18	Part of hurricane evacuation route	10.0
19	Part of National Freight Network or TxDOT Primary Freight Network	10.0
20	Part of Energy Sector Route	9.6

Corridor Prioritization Tool (CPT)

Corridor Prioritization – Performance Weights



*Performance Metric Weights are set and used consistently in scoring calculations.

Sample Corridor Prioritization Results - Overall

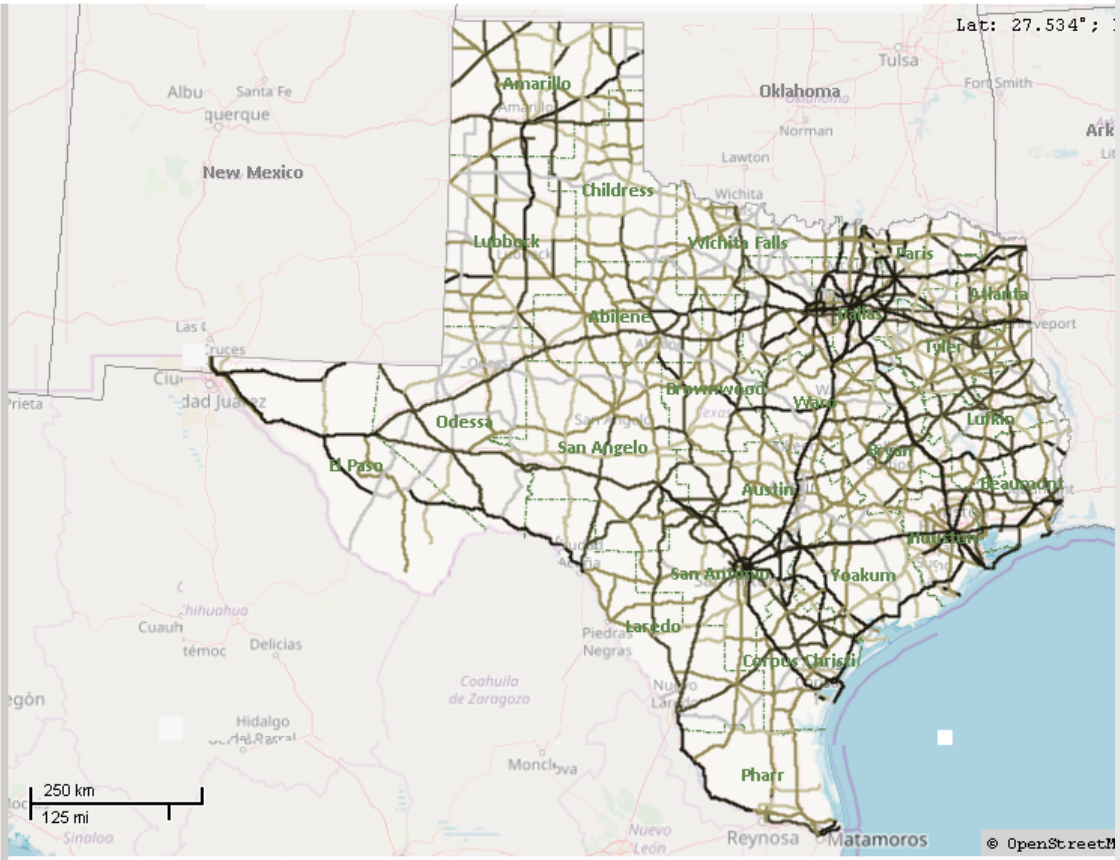
CPT | HOME: Introduction, Workflow | CORRIDORS SET UP: Initiate, Select | CORRIDOR PRIORITIZATION: Results, Detail, Report

Results | Table View | **Map View** | Weight | Map Display Option : **Fast Mode** | Switch to Full Mode >>

Zoom To State | Previous | Next | Update Map

Select a metric : **Overall**

Rank	Corridor	Description	Score
1	IH0635_0_37_S	I-20 to SR 121	72.66
2	IH0035E_371_468	Hillsboro to Denton	65.81
3	IH0610_0_38_S	I-10 to I-10	65.73
4	IH0410_0_53_S	I-35 to I-35	62.16
5	IH0820_0_36_S	I-20 to I-20	58.20
6	SH0352_588_602	State Highway 352	55.72
7	IH0035_155_250_	San Antonio to Austin	55.25
8	SH0087_478_585	Pinehurst to Galveston	54.47
9	US0087_696_840	San Antonio to Port Lavaca	54.08
10	SH0004_558_583	State Highway 4	53.93
11	US0060_322_458	Amarillo to Stateline	53.38
12	SH0078_196_287	State Highway 78	53.06
13	SH0003_476_508	State Highway 3	52.81
14	US0062_16_149_	Stateline to Stateline	52.60
15	SH0123_466_538	State Highway 123	52.02
16	US0077_297_337	Red Oak to Hillsboro	51.82
17	US0180_417_555	Anson to Weatherford	51.71
18	SH0080_461_550	State Highway 80	50.68
19	IH0035W_0_86_S	Hillsboro to Denton	50.66
20	US0075_193_271	Stateline to Dallas	49.89
21	SH0180_620_646	State Highway 180	49.79
22	US0377_192_367	TX North Border to Stephenville	49.01
23	SH0048_558_580	State Highway 48	49.01



Overall Prioritization Score

Highest Priority | Elevated Priority | Average Priority | Moderate Priority | Lowest Priority

Sample Corridor Prioritization Results - Details

CPT | HOME: Introduction, Workflow | CORRIDORS SET UP: Initiate, Select | CORRIDOR PRIORITIZATION: Results, Detail, Report | AECOM

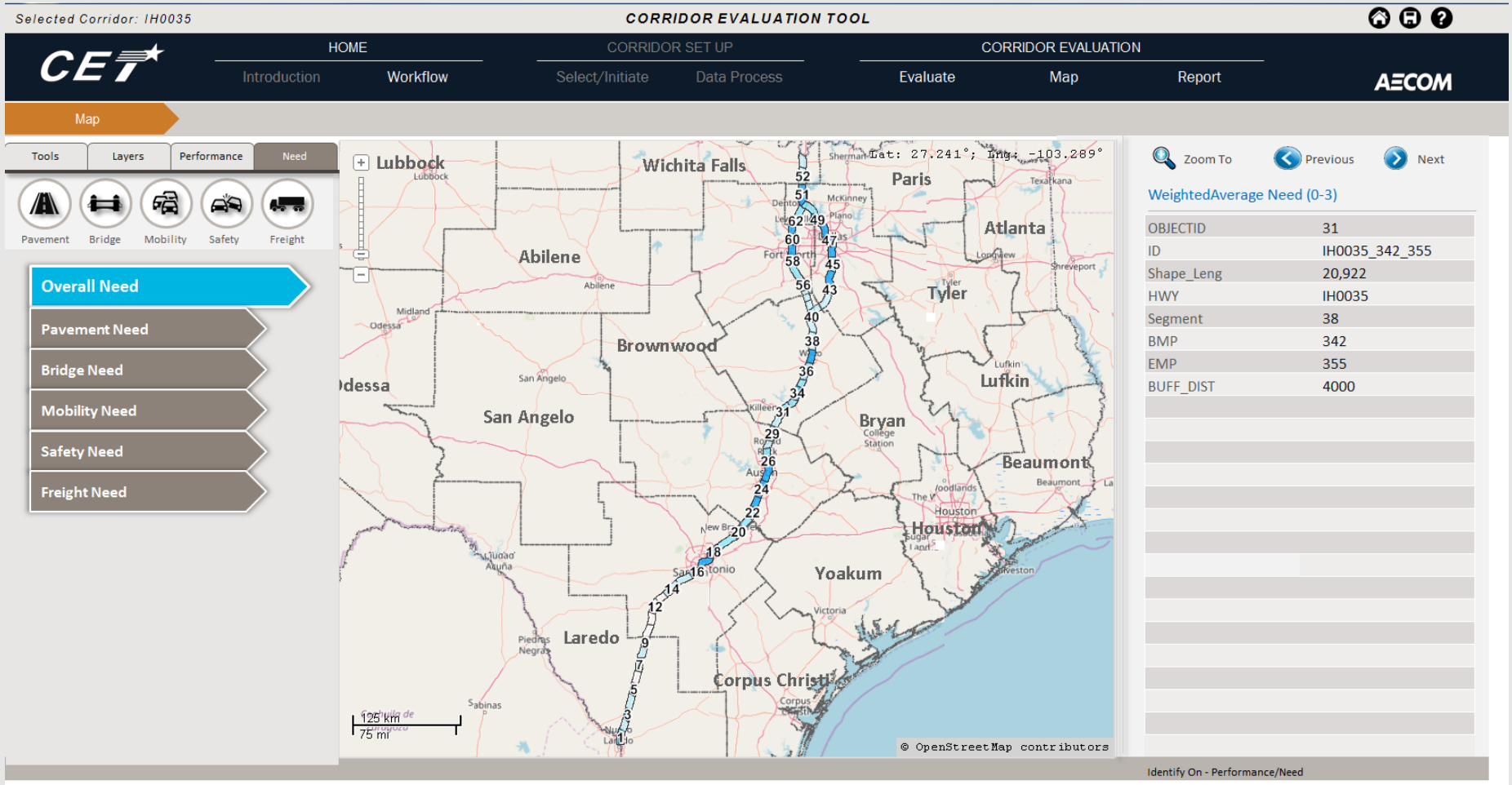
Results | Table View | Map View | Weight

Select a metric : Overall Recalculate

Top 10% | 30%+ from Average | Above Average

			Weight	Pavement	Bridge	Safety	Congestion	Economic	Connectivity
				11.1%	11.1%	27.8%	22.2%	11.1%	16.7%
Rank	Corridor	Description	Overall Score	Pavement Score	Bridge Score	Safety Score	Congestion Score	Economic Score	Connectivity Score
			score (0-100)	score (0-10)	score (0-10)	score (0-10)	score (0-10)	score (0-10)	score (0-10)
1	IH0635_0_37_S	I-20 to SR 121	72.66	8.15	2.51	8.53	10.00	7.77	3.76
2	H0035E_371_468_S	Hillsboro to Denton	65.81	9.51	4.97	5.32	8.42	7.97	4.43
3	IH0610_0_38_S	I-10 to I-10	65.73	4.52	7.22	4.52	10.00	7.67	5.63
4	IH0410_0_53_S	I-35 to I-35	62.16	3.10	2.08	9.55	6.05	7.76	4.67
5	IH0820_0_36_S	I-20 to I-20	58.20	1.61	1.69	9.53	7.03	6.14	3.37
6	SH0352_588_602_S	State Highway 352	55.72	10.00	6.00	9.68	.40	4.98	2.78
7	IH0035_155_250_S	San Antonio to Austin	55.25	2.34	2.02	5.22	9.15	6.90	4.75
8	SH0087_478_585_S	Pinehurst to Galveston	54.47	9.13	6.00	9.83	.30	3.96	3.17
9	US0087_696_840_S	San Antonio to Port Lavaca	54.08	8.04	9.22	6.80	1.17	4.89	4.80
10	SH0004_558_583_S	State Highway 4	53.93	6.06	6.00	10.00	.70	3.84	4.16
11	US0060_322_458_S	Amarillo to Stateline	53.38	10.00	4.46	10.00	.03	3.32	3.46
12	SH0078_196_287_S	State Highway 78	53.06	10.00	7.10	8.98	.54	5.26	1.24
13	SH0003_476_508_S	State Highway 3	52.81	4.03	9.30	8.23	.88	4.82	4.68
14	US0062_16_149_S	Stateline to Stateline	52.60	8.02	6.00	10.00	.12	4.47	2.41
15	SH0123_466_538_S	State Highway 123	52.02	10.00	10.00	6.34	.52	4.19	3.83
16	US0077_297_337_S	Red Oak to Hillsboro	51.82	1.06	8.93	10.00	1.41	6.79	1.35
17	US0180_417_555_S	Anson to Weatherford	51.71	7.55	10.00	8.76	.00	2.78	2.87
18	SH0080_461_550_S	State Highway 80	50.68	10.00	10.00	5.68	.91	4.40	3.45
19	IH0035W_0_86_S	Hillsboro to Denton	50.66	1.35	2.30	7.61	4.86	6.74	4.31
20	US0075_193_271_S	Stateline to Dallas	49.89	9.53	3.04	.72	8.83	8.37	3.00

Prioritization of Projects by Corridor Need



Corridor Evaluation Tool: Measures and Data Sources

Category	Performance Measure	Data Source
Pavement	**Pavement Index**	PMIS/TxDOT OpenData portal; latest available data
	Directional Main lane Distress Score	
	Directional Main lane Ride Score	
	Frontage Road Pavement Condition Score	
	Pavement Failure	
Bridge	**Bridge Index**	BRINSAP/TxDOT OpenData portal; latest available data
	Bridge Sufficiency	
	Functionally Obsolete Bridges	
	Bridge Rating	
	Culvert Rating	
Safety	**Safety Index**	CRIS; 5 years of data
	Directional Main Lane Crash Rate	
	Frontage Road Crash Rate	
	Safety Hot Spots	
Mobility	**Mobility Index**	Volume data from RHINO; Years 2017 and 2038 Capacity calculated using generalized equations based on facility type and data from RHINO (# of lanes, % trucks, etc.)
	Future Daily V/C	
	Peak Hour V/C	
	Frontage Road Existing V/C	
	Frontage Road Future V/C	
	Directional Travel Time Index	INRIX; average over 1 year of data
	Directional Planning Time Index	INRIX; average over 1 year of data
	Interchange Existing V/C	Volume data from RHINO; Years 2017 and 2038 Capacity calculated using generalized equations based on facility type and data from RHINO (# of lanes, % trucks, etc.)
	Interchange Future V/C	
Freight	**Freight Index**	INRIX; average over 1 year of data
	Truck Directional Travel Time Index	INRIX; average over 1 year of data
	Truck Directional Planning Time Index	INRIX; average over 1 year of data
	Bridge Vertical Clearance	BRINSAP/TxDOT OpenData portal; latest available data
	Bridge Load Ratings	BRINSAP/TxDOT OpenData portal; latest available data

Sample Corridor Evaluation Tool Results

CET Needs Preliminary Results (Segment 1-63).pdf - Adobe Acrobat Pro

File Edit View Window Help

Open Create Customize

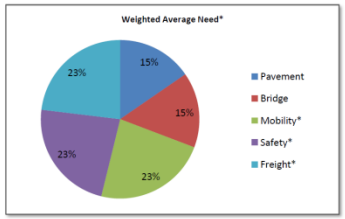
Tools Fill & Sign Comment

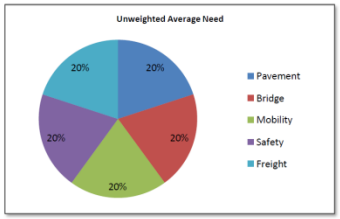
I-35 Corridor Needs Summary - Preliminary Results (Working in Progress)

Seg. #	HWY	BMP	EMP	Length (miles)	Mainline Facility Type	Need							Rank**
						Pavement	Bridge	Mobility*	Safety*	Freight*	Weighted Average Need	Unweighted Average Need	
25	I-35	235	247	12	Urban	0.02	1.96	13.69	1.70	18.78	7.23	8.19	1
24	I-35	222	235	13	Urban	0.10	1.16	12.18	2.09	18.57	6.82	7.77	2
18	I-35	163	174	11	Urban	0.29	0.56	11.04	2.65	14.94	5.90	6.74	3
26	I-35	247	254	7	Urban	0.00	0.78	11.92	1.59	13.56	5.57	6.37	4
17	I-35	152	163	11	Urban	0.92	1.88	7.38	4.26	10.21	4.93	5.47	5
33	I-35	297	303	6	Urban	0.68	1.41	5.14	1.59	8.64	3.49	3.87	6
37	I-35	332	342	10	Urban	1.86	1.75	4.80	4.09	4.41	3.38	3.62	7
3	I-35	19	28	9	Rural	0.21	0.50	1.04	11.35	3.23	3.27	3.71	8
34	I-35	303	313	10	Rural	0.36	0.43	7.28	1.90	6.25	3.24	3.68	9
23	I-35	214	222	8	Rural	0.08	0.27	8.63	0.32	4.66	2.79	3.19	10
19	I-35	174	188	14	Urban	0.11	0.55	3.71	1.15	7.95	2.69	3.06	11
32	I-35	292	297	5	Urban	0.18	1.60	3.83	1.39	5.34	2.47	2.71	12
27	I-35	254	260	6	Urban	0.00	0.92	6.18	0.16	4.84	2.42	2.72	13
36	I-35	319	332	13	Rural	0.10	0.86	6.90	0.24	3.51	2.32	2.60	14
21	I-35	197	206	9	Rural	0.00	0.65	6.59	0.65	3.56	2.29	2.59	15
35	I-35	313	319	6	Rural	0.12	0.05	7.14	0.66	3.23	2.24	2.57	16
22	I-35	206	214	8	Rural	0.13	0.56	5.51	0.39	2.01	1.72	1.93	17
1	I-35	0	11	11	Urban	0.24	0.69	0.93	5.07	1.51	1.69	1.87	18
16	I-35	142	152	10	Rural	0.56	1.53	2.14	1.46	2.2			
51	I-35	468	482	14	Rural	0.12	1.55	3.39	0.82	1.8			
39	I-35	355	364	9	Rural	0.06	0.67	5.90	0.56	0.3			
38	I-35	342	355	13	Rural	0.02	0.02	6.09	0.46	0.0			
20	I-35	188	197	9	Rural	0.03	0.43	4.87	0.47	0.1			
15	I-35	131	142	11	Rural	0.54	0.57	1.83	1.56	1.0			
53	I-35	495	505	10	Rural	0.11	1.53	1.85	0.56	1.4			
52	I-35	482	495	13	Rural	0.02	1.21	2.60	0.00	1.4			
29	I-35	266	277	11	Rural	0.00	0.68	2.37	0.43	1.6			
									0.26	0.0			
									0.43	0.0			
									1.89	0.9			
									0.56	0.1			
									3.46	0.1			

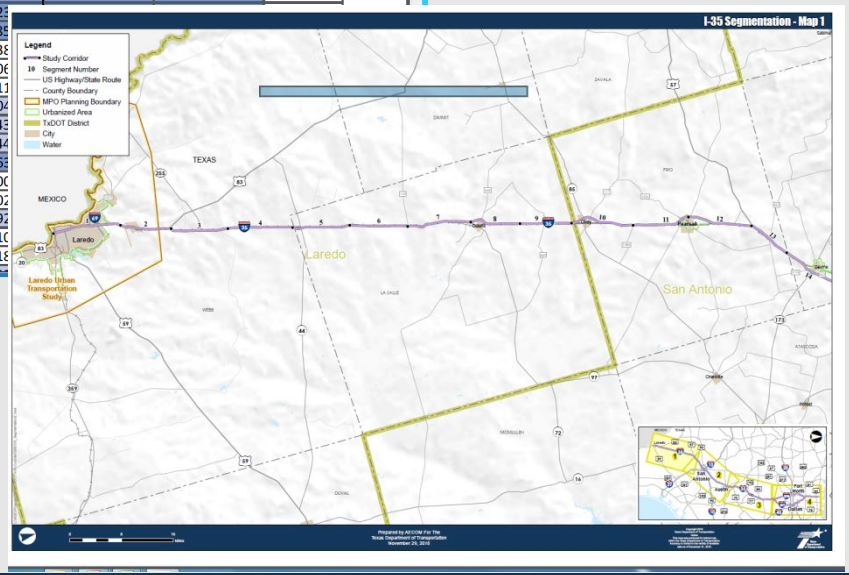
** Ranks are based on Weighted Average Need from highest to lowest.
I-35E and I-35W ranks are to be determined due to missing metric values.

Level of Need	Score
NONE	0 - 0.5
LOW	0.5 - 1.5
MEDIUM	1.5 - 2.5
HIGH	> 2.5

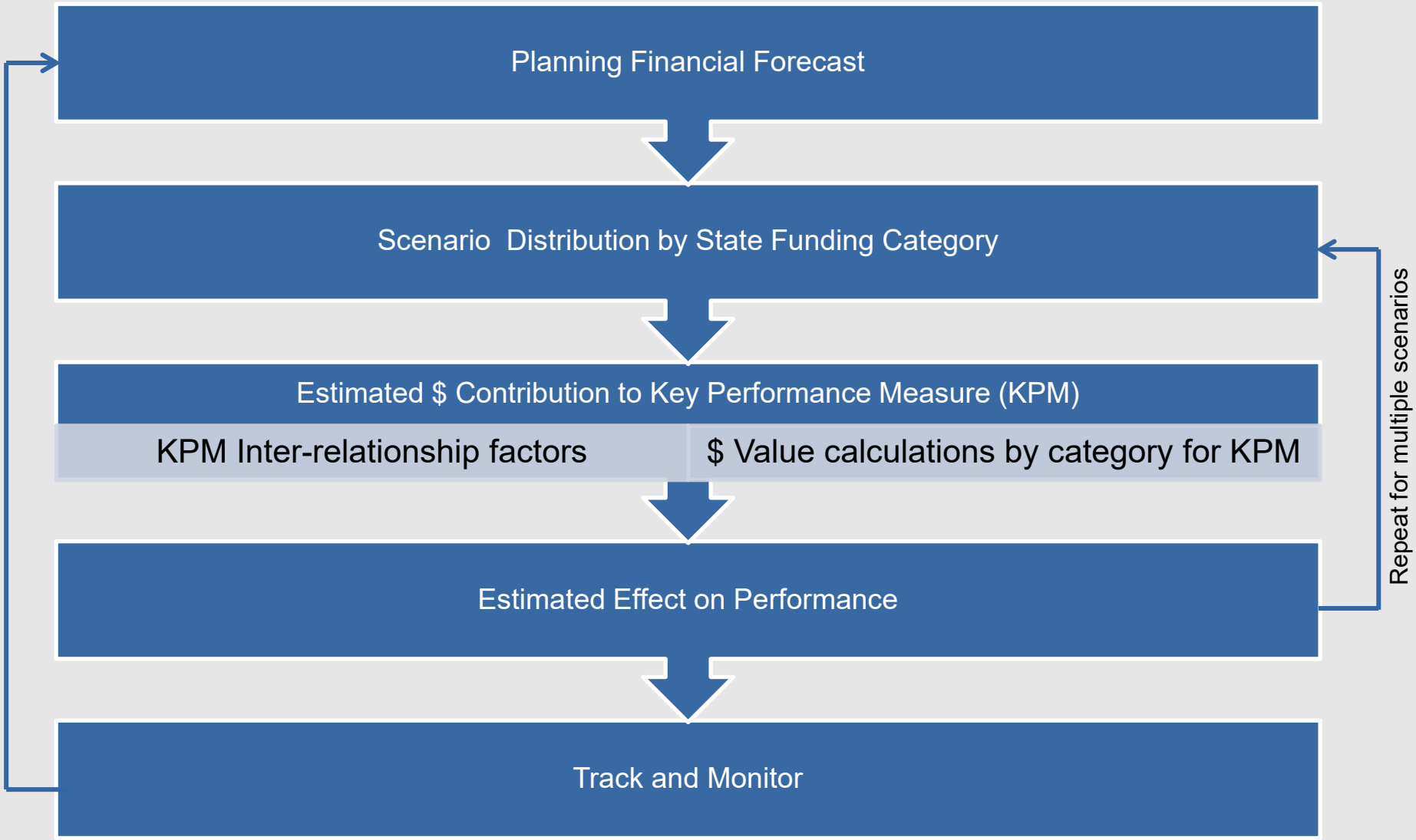




*Emphasis Areas are weighted by a factor of 1.5.



4. Performance-Based 10-yr Program Investment Scenarios



Key Measures for TxDOT 10-Year Program Investment Performance

- **Safety: Total Fatalities** – Number of fatalities per year.
- **Safety: Fatality Rate** – Number of fatalities per year per 100 million vehicle miles traveled (VMT).
- **Preservation: Statewide Pavement Condition** - Percent of lane miles of pavement in good or better condition.
- **Preservation: Statewide Bridge Condition** - overall condition of our bridge inventory.
- **Congestion Mitigation: Statewide All Urban Travel Time Index** - Ratio of the peak period average travel time to the free flow travel time.
- **Enhanced Connectivity: Statewide Rural Reliability Index** - Estimates 95th percentile delay on specific routes (during the heaviest traffic days).

Sample Performance "Crosswalk"

To address performance, understand how much money will map from each of the 12 UTP Categories to the key performance areas: Safety, Preservation, Congestion, and Connectivity using the "crosswalk" percentages.

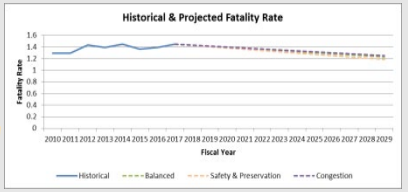
Category	Safety	Preservation	Congestion Reduction	Enhance Connectivity	Total Percentage
1	29%	45%	3%	23%	100%
2	41%	19%	24%	16%	100%
3	20%	20%	31%	29%	100%
4 Regional	43%	18%	0%	39%	100%
4 Urban	38%	22%	10%	30%	100%
5	52%	20%	17%	11%	100%
6	55%	3%	1%	41%	100%
7	57%	19%	12%	12%	100%
8	93%	2%	0%	5%	100%
9	74%	26%	0%	0%	100%
10	75%	8%	1%	16%	100%
11	35%	35%	4%	26%	100%
12 Clear Lanes	41%	19%	24%	16%	100%
12 Strategic Priority	38%	22%	10%	30%	100%

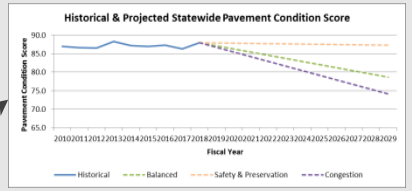
Sample Scenario Investment & Performance Projections

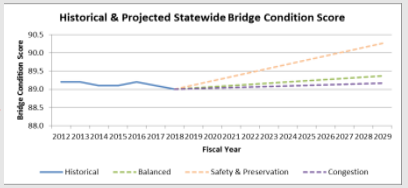
Investment Scenario Distribution → Investment Scenario "Crosswalk" → Performance Projections

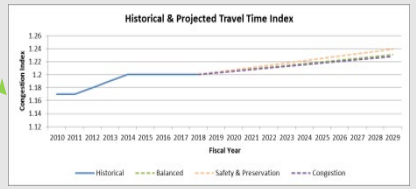
Category Allocations	Balanced Strategy ($B)
Category 1- Maintenance	$14.1
Category 2 –Metro & Urban Corridor	$13.0
Category 3 - Non-Traditional	$5.4
Category 4 - Connectivity (Regional)	$6.9
Category 4 - Connectivity (Congestion)	$5.7
Category 5 - CMAQ	$2.2
Category 6 - Bridge	$3.6
Category 7 - Fed STP-MM	$4.6
Category 8 - Safety	$3.4
Category 9 - TAP	$0.9
Category 10 - Supplemental Projects	$0.6
Category 11 - District Discretionary	$1.1
Category 11 - Energy Sector	$2.1
Category 12-Strategic Priority	$8.3
Category 12-Texas Clear Lanes	$5.0
Total All Funds	$76.9

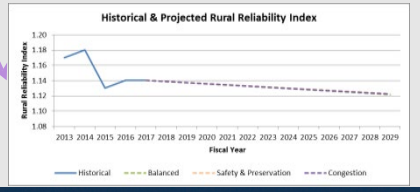
Performance Area	Est. Investment ($B)
Safety	$33.1
Pavement Preservation	$18.5
Bridge Preservation	$5.4
Congestion Mitigation	$39.6
Enhanced Connectivity	$17.7



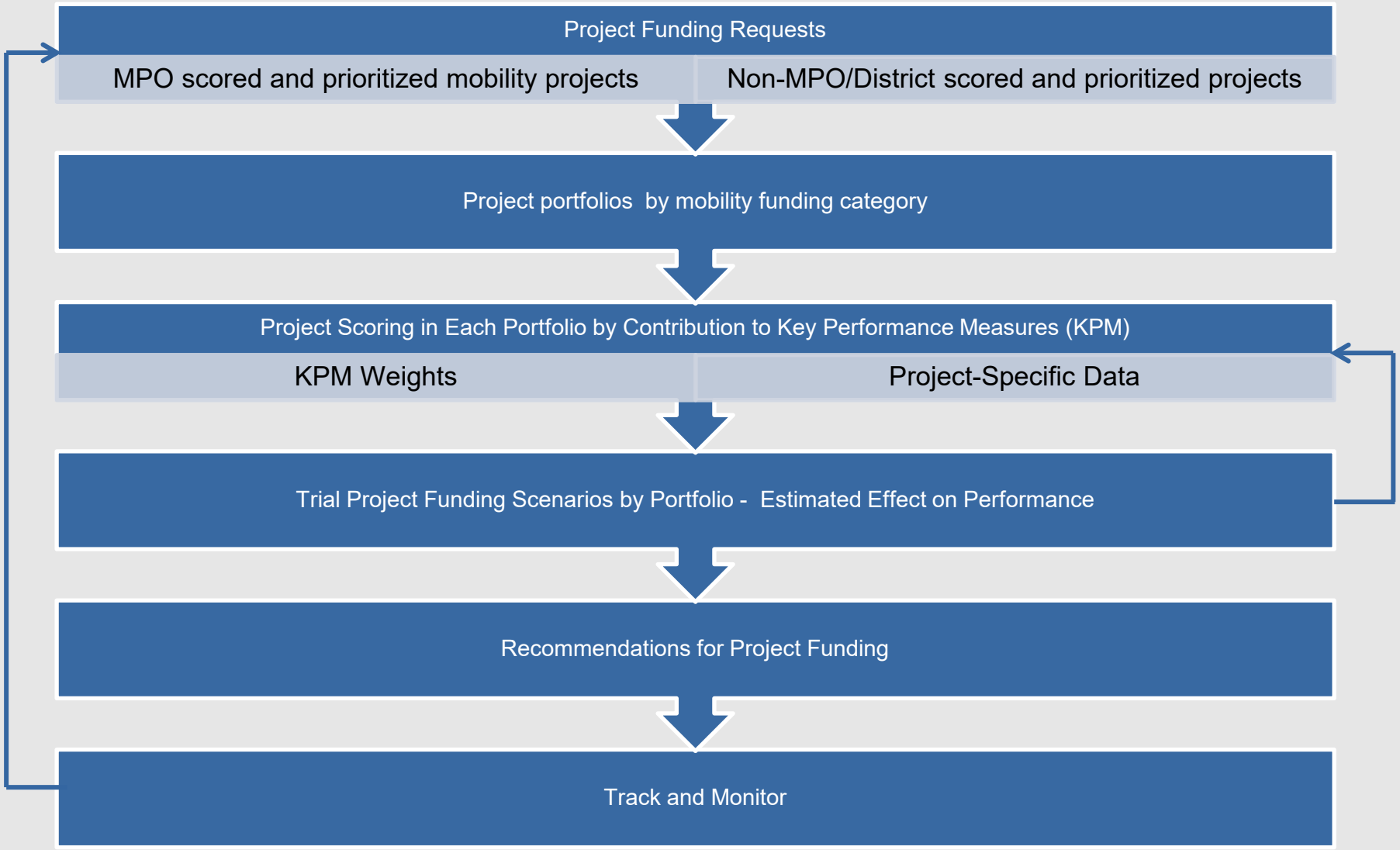




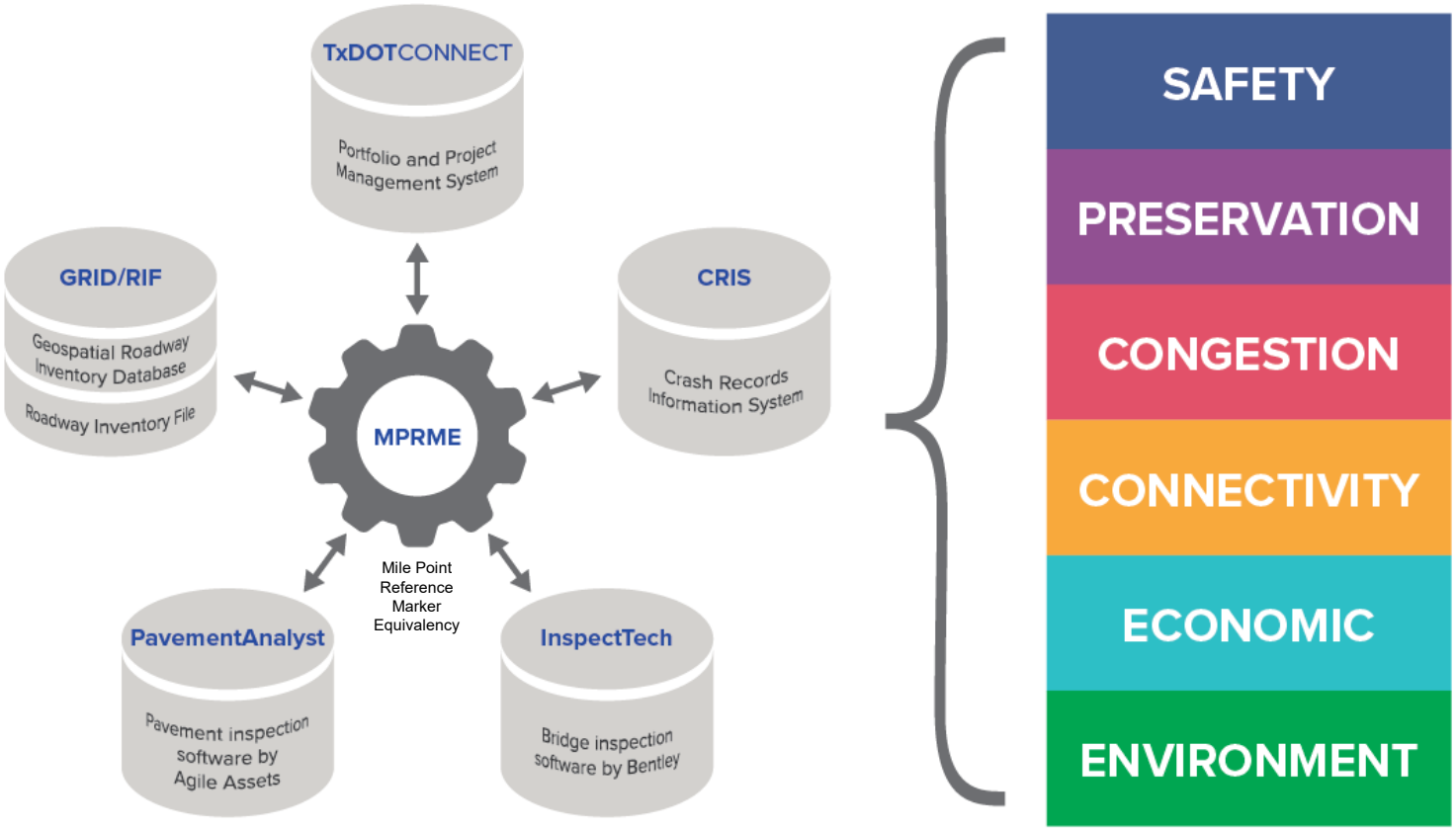




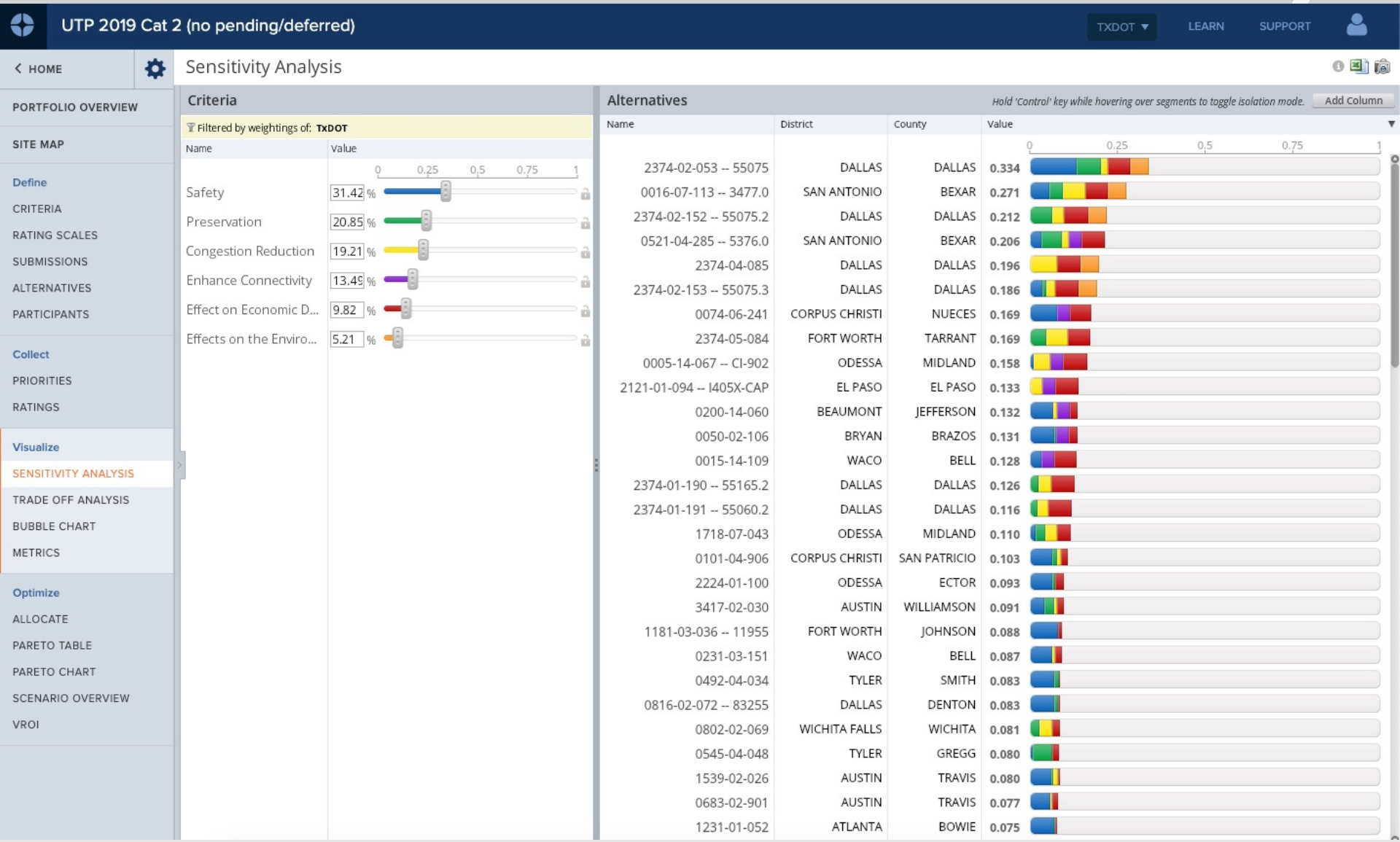
5. Performance-Based Project Selection



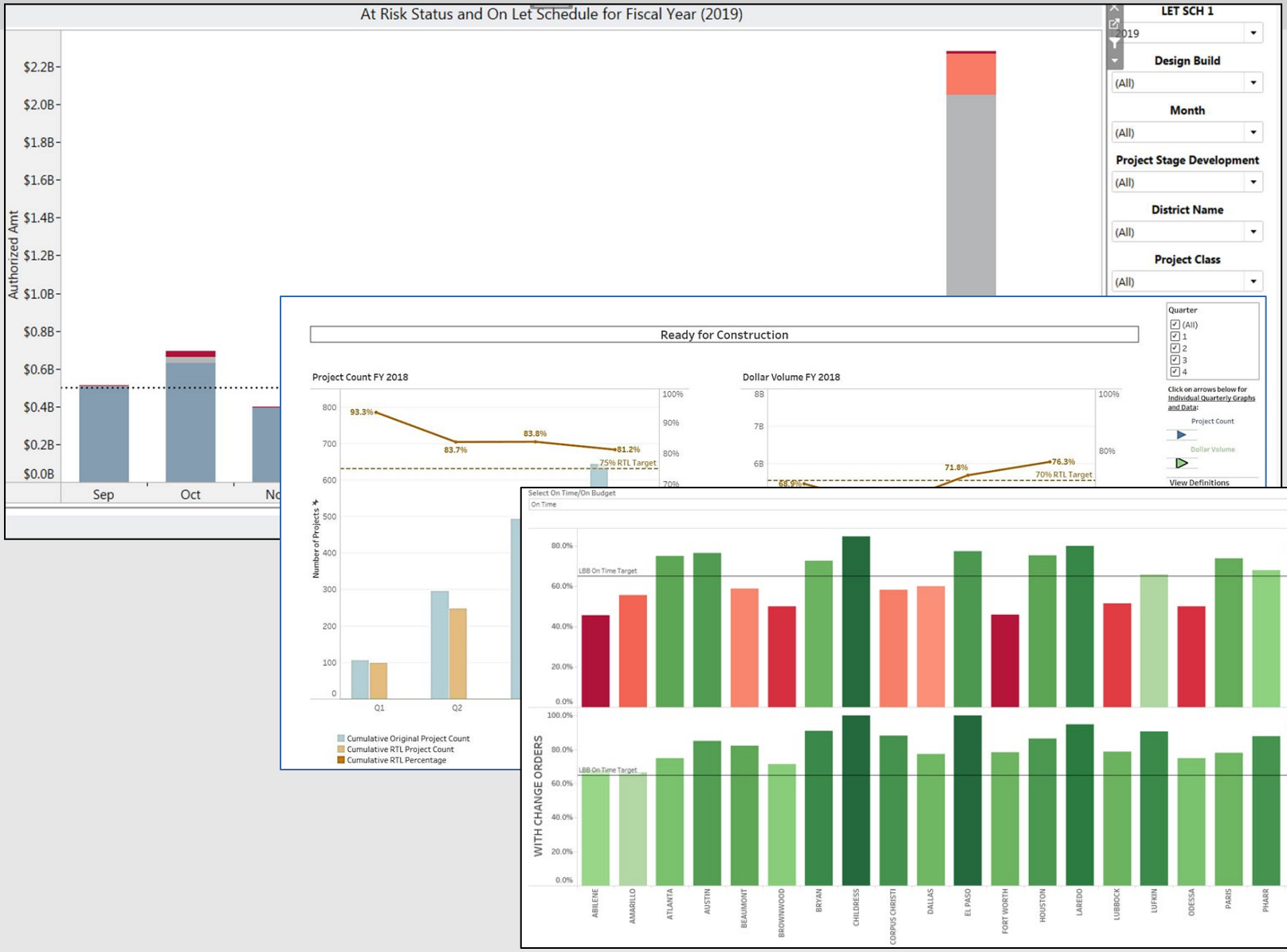
Key Data Sources for Project & Portfolio Performance Assessment



Sample Project Portfolio Scoring in Decision Lens



7. Monitoring and Tracking



7. Challenges, Needs, and Conclusion

Key challenges and needs:

- Accuracy, currency and extent of input data
- History of investments and actual outcomes to help improve performance predictability
- Safety: Optics of non-zero fatalities targets, limitations of what we can control
- Statewide mobility measures are insensitive to investment dollars

Conclusion

- Concepts and approaches are at various stages of development and implementation that will support investment decision-making at progressive stages of TxDOT's transportation program and project development
- More data, time and experience are needed to validate approaches and improve confidence in predictability of performance outcomes
- But, there's no "F = MA" for performance-based planning and programming. Investment decisions will always need to address qualitative considerations as well as quantitative approaches

THANK YOU!
Please Surf Safely.